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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 060127

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

CLOTHES DESIGNER(profess. + KIN.) 142.091

S-88

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EDUCATION & WELFARE
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U. S. Employment Service in
Cooperation with
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U. S. DEPARTMENT OF LABOR
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GATB #2089C, 788 and 2085
1948 and 1955

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR CLOTHES DESIGNER (profess. + KIN.) 142.021-012 S-88

Summary

The General Aptitude Test Battery was administered to two samples of students enrolled in a two year Design course at the Fashion Institute of Technology in New York City, in preparation for the occupation of Clothes Designer 142.021. The Validation Sample includes a group of thirty-four female students who were tested in December 1954 and sixty-eight students (64 females and 4 males) who were tested in May 1955 with the GATB, B-1002A. Both groups were combined to make a sample of 102 students. The criterion consisted of grade-point averages for the two year course.

The Cross Validation Sample includes forty-seven students (38 females and 9 males) who were tested during the school year 1947-1948 with the General Aptitude Test Battery, B-1001. The criterion consisted of grade-point averages for the two year course.

On the basis of statistical results of the combined study, as well as the statistical results obtained for each experimental sample, and an analysis of the course description and the job description for Clothes Designer 142.021, the following aptitudes were selected for inclusion in the test norms: G-Intelligence, S-Spatial Aptitude, P-Form Perception and K-Motor Coordination.

GATB Norms for Clothes Designer (profess. + KIN.) 142.021

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Clothes Designer 142.021.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-88

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	105	G	Part 3 Part 4 Part 6	100
S	CB-1-F CB-1-H	105	S	Part 3	100
P	CB-1-A CB-1-L	100	P	Part 5 Part 7	100
T	CB-1-G CB-1-K	90	K	Part 8	95

Effectiveness of Norms

The data in Table V-C indicate that 28 of the 49 poor students, or 57 percent of them did not achieve the minimum scores established as cutting scores on the recommended test norms. Moreover, 73 of the 94 students who made qualifying test scores, or 78 percent, were good students.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Clothes Designer 142.081.

II. Sample

This study is based on two samples of students enrolled in a two year Design course at the Fashion Institute of Technology in New York City, in preparation for the occupation of Clothes Designer 142.081. The Validation Sample was tested with the B-1002A edition of the GATB; the Cross Validation Sample was tested with the B-1001 edition of the GATB.

A. Validation Sample

The Validation Sample consists of two groups of senior class members: 34 female students who were tested in December 1954 and 68 students (64 females and 4 males) who were tested in May 1955. Both groups were tested with the B-1002A edition of the GATB. The two groups were combined into one sample of 102 students on the basis of the following: the course content for both samples was identical; the same performance standards were applicable to both samples and comparable criterion data were available; both groups were at approximately the same age level.

B. Cross Validation Sample

The Cross Validation Sample consists of 47 upper class members (38 females and 9 males) who were tested during the 1947-48 school year with the B-1001 edition of the GATB.

Table II shows the means, standard deviations, ranges and Pearson product-moment correlations with the criteria for years of age for the Validation, Cross Validation, and Combined Samples.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Years of Age

Clothes Designer (profess. & kin.) 142.081

Sample	N	M	σ	Range	r
Validation	102	20.1	1.9	18.5 - 30	.279*
Cross Validation	47	20.9	2.8	19 - 32	.315*
Combined	149	20.3	2.2	18.5 - 32	---

* Significant at the .01 level

The two samples appear to be similar with respect to age, although the mean is slightly higher and the dispersion somewhat greater for the Cross Validation Sample. The significant correlations of low magnitude between age and the criteria for both the Validation Sample and the Cross Validation Sample probably reflect the influence of several cases between the ages of 25 years and 32 years; all of these students except one had grade-point averages above the mean of the sample.

Although education data for the students in the sample were not provided, graduation from an academic, vocational or technical high school is required for admission to the Fashion Institute of Technology. None of the students had had occupational experience as Clothes Designer.

III. Job Description

Job Title: Clothes Designer (profess. & kin.) 142.031-018

Job Summary: Designs and prepares original patterns for new types and styles of women's and children's wearing apparel. Seeks ideas for new clothing designs by reading publications such as trade journals and fashion magazines, visiting fashion displays and conferring with salesmen and buyers on trade preferences. Sketches new designs and makes paper patterns for garments. Studies and performs the machine and hand operations required to construct garments so that designs may be in keeping with actual production methods. Introduces sample garments to sales staff and management and inspects completed garments on models for lines, drape, proportions and other features. Writes garment specifications for production purposes. Follows up on success of new clothing designs by checking on quantities ordered and reordered.

Work Performed: Seeks ideas for new clothing designs: Reads trade journals, foreign and domestic fashion magazines and fashion sections of newspapers. Keeps portfolios of selected clippings on fashion previews, fashionable clothes worn at the opera, play openings, resorts and night clubs. Studies type of clothes worn by stage and screen stars and other prominent people. Confers with salesmen and buyers on trade preferences. May visit art exhibits, trade fairs, garment centers, fashionable hotels, and night clubs for first-hand observations.

Designs garments and makes original patterns: Selects best features of one or more styles, making changes and adaptations to form new interpretation and makes sketch of new design. Selects fabric and trimming from samples or stock on hand. Makes an original pattern either by (a) draping percalene or muslin on figure form and cutting paper pattern from draped sections, or (b) using standard measurements for making paper pattern and cutting percalene model from it. Sews sections together or has them sewed. Studies and performs the machine and hand operations required to construct garments so that designs may be in keeping with actual production methods. Inspects model on figure form for fit and line. May compute cost of producing garment, making any design changes necessary to meet cost limitations. Gives sketch, pattern, and sample for fabric and trim to Sample Tailor.

Introduces sample garment: Shows garment as worn by living model to sales staff and management. Inspects completed garment on figure form and on living model for line, drape, proportion, and other features. Receives official approval from management to put model into production. Writes specifications

for garment, describing construction, color scheme, and types of fabrics to be used. Enters sketch and data concerning garment in firm's stylebook to provide record of design.

Follows up success of new garment: Examines stock garments to see that production department is meeting specifications. Keeps informed of buyers' orders and reorders, and notes color and size preferences and regional response for future reference.

IV. Experimental Battery

All parts of the GATB, B-1002A, were administered to the Validation Sample. All parts of the GATB, B-1001, were administered to the Cross Validation Sample.

V. Criterion

The criterion for both the Validation and Cross Validation Samples consists of grade-point averages which were based on all courses for the four terms. This criterion was chosen because school authorities believed that grade-point averages based on all of the courses would provide a better indication of school success than grade-point averages based on shop-type courses only. A grade-point average is computed by multiplying the grade value of each mark by the number of periods per week. The total is divided by the number of hours of instruction. The following grades were used for final marks:

Mark	Grade Value
H - Honor	4
G - Good	3
S - Satisfactory	2
L - Low	1
F - Failure	0
Inc. - Incomplete	0

A grade-point average of 2.00 is required to remain in the Institute.

Table III shows the means, standard deviations and ranges of the grade-point averages for the Validation Sample and the Cross Validation Sample.

TABLE III

Means (M), Standard Deviations (σ), and Ranges of Grade-Point Averages

Clothes Designer (profess. + kin.) 142.081

Sample	N	M	σ	Range
Validation	102	2.60	.35	2.00 -3.77
Cross Validation	47	2.67	.37	1.93 -3.39

The data in Table III show the Validation and Cross Validation Samples to be similar with respect to the obtained grade-point averages in terms of both level of performance and dispersion. In the Cross Validation Sample, one student had a grade-point average slightly below 2.00, but apparently continued to pursue the course of study at the school.

For the Validation Sample the reliability of the criterion was determined by correlating the average course grades for the first and fourth terms with the average course grades for the second and third terms. The obtained coefficient of correlation was .749; application of the Spearman-Brown Prophecy formula raises this coefficient to .856. For the Cross Validation Sample only total grade-point averages for all four terms were provided; separate grade-point averages for each of the four terms were not made available, therefore; the reliability of the criterion for the Cross Validation Sample was not computed.

VI. Statistical and Qualitative Analysis

Both samples of Clothes Designer students were undergoing substantially the same type of training at the same school. Examination of available data has shown that the two samples are sufficiently similar with respect to age, performance in the school and aptitude level to warrant combining the data whenever statistically feasible. Therefore, data for the samples have been analyzed separately and in combination on the basis of both statistical and qualitative considerations. Means, standard deviations and correlations with the criterion were calculated for the aptitude scores for each sample separately. Means and standard deviations of the aptitude scores were also calculated for the Combined Sample.

Since the Validation Sample was tested with the B-1002A edition of the GATB and the Cross Validation Sample was tested with the B-1001 edition of the GATB, it was necessary to convert the B-1001 aptitude score means and standard deviations of the Cross Validation Sample to equivalent B-1002 means and standard deviations before combining the data of these two samples. The conversions were based on standard score equations for B-1001 and B-1002 aptitude scores. Appropriate formulae were used to combine the data to obtain means and standard deviations of the B-1002 aptitude scores for the Combined Sample of 149 students.

Table IV-A shows the B-1002 means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB for the Validation Sample. Table IV-B shows the B-1001 means and standard deviations, equivalent B-1002 means and standard deviations and Pearson product-moment correlations with the criterion for the aptitudes of the GATB for the Cross Validation Sample. Table IV-C shows the means and standard deviations for the aptitudes of the GATB, B-1002, for the Combined Sample.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE IV-A

B-1002 Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Clothes Designer (profess. + KIN.) 142.081

Validation Sample
N = 102

Aptitudes	M	σ	r
G-Intelligence	109.7	11.0	.366**
V-Verbal Aptitude	111.5	11.9	.334**
N-Numerical Aptitude	100.3	12.9	.291**
S-Spatial Aptitude	114.6	14.5	.210*
P-Form Perception	114.8	13.9	.307**
Q-Clerical Perception	111.9	10.9	.140
K-Motor Coordination	115.9	16.3	.196*
F-Finger Dexterity	116.7	16.5	.078
M-Manual Dexterity	108.8	18.3	.077

** Significant at the .01 level
* Significant at the .05 level

TABLE IV-B

B-1001 Means (M) and Standard Deviations (σ), Equivalent B-1002 Means and Standard Deviations and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Clothes Designer (profess. + KIN.) 142.081

Cross Validation Sample
N = 47

	B-1001		Equivalent B-1002		
Aptitudes	M	σ	M	σ	r
G-Intelligence	116.9	14.3	111	13	.156
V-Verbal Aptitude	115.4	15.5	113	16	.216
N-Numerical Aptitude	106.6	15.4	102	14	-.066
S-Spatial Aptitude	122.1	14.8	118	15	.330*
P-Form Perception	116.4	17.6	113	17	.179
Q-Clerical Perception	108.0	16.9	108	15	-.169
A-Aiming #	116.5	19.3	116	18	.133
T-Motor Speed #	107.1	18.4	109	18	.156
F-Finger Dexterity	110.7	15.0	107	15	.172
M-Manual Dexterity	98.3	17.5	95	18	.258

* Significant at the .05 level
# Converts to equivalent B-1002 score on

TABLE IV-C

Means (M) and Standard Deviations (σ) for the Aptitudes of the GATB, B-1002

Clothes Designer (profess. + kin.) 142.081

Combined Sample
N = 149

Aptitudes	M	σ
G-Intelligence	110.3	11.7
V-Verbal Aptitude	112.3	13.4
N-Numerical Aptitude	100.6	13.4
S-Spatial Aptitude	115.9	14.4
P-Form Perception	114.4	15.0
Q-Clerical Perception	110.7	12.5
K-Motor Coordination #	113.8	17.0
F-Finger Dexterity	113.8	16.4
M-Manual Dexterity	104.6	19.1

Based on combination of converted Aptitude T data for the Cross Validation Sample and Aptitude K data for the Validation Sample.

The statistical results were interpreted in the light of job analysis data and course descriptions. The job analysis and the course descriptions indicated that the following aptitudes measured by the GATB appeared to be important for this occupation:

Intelligence (G) - required to understand the principles of design and the techniques of constructing garments; to acquire essential knowledge of fabrics, design and color; to gather ideas for new models by reading fashion magazines and trade journals.

Spatial Aptitude (S) - required to visualize or perceive the garments to be made or fitted; to create and sketch designs and to construct and use original patterns.

Form Perception (P) - required to drape and fit models, to inspect samples for line, drape and fit in order to make adjustments.

Motor Coordination (K) - required for manipulative skills needed in draping, fitting and constructing garments.

Finger Dexterity (F) and Manual Dexterity (M) - required to perform the machine and hand operations necessary to construct garments and to drape and fit garments.

Table IV-A, which presents data for the Validation Sample, shows that the highest mean scores in descending order of magnitude were obtained for Aptitudes F, K, P and S, respectively. All of the aptitudes have standard deviations of less than 20 with Aptitude Q exhibiting the smallest standard deviation. When N = 102, correlations of .254 and .195 are required for significance at the .01 and .05 levels of confidence, respectively. Aptitudes G, V, N and P show correlations with the criterion significant at the .01 level and Aptitudes S and K show significant correlations with the criterion at the .05 level.

Table IV-B, which presents data for the Cross Validation Sample, shows that the highest mean scores in decreasing order of magnitude were obtained for Aptitudes S, G, A, P and V, respectively. All of the aptitudes have standard deviations of less than 20, with Aptitude G exhibiting the smallest standard deviation. When N = 47, correlations of .372 and .288 are required for significance at the .01 and .05 levels of confidence, respectively. Aptitude S shows a correlation with the criterion significant at the .05 level.

Table IV-C, which presents means and standard deviations of the aptitudes measured by the B-1002 edition of the GATB for the Combined Sample, shows that the highest mean scores in descending order of magnitude were obtained for Aptitudes S, P, K, F and V, respectively. Aptitude G shows the smallest standard deviation for the Combined Sample.

Aptitudes G, S, P, K and F (G, S, P, T and F for B-1001) were considered for inclusion in the test norms on the basis of the qualitative and quantitative factors cited above. All of these aptitudes appear to be important in terms of job analysis data. Aptitudes S, P, K and F have high mean scores for both the Validation and Combined Samples. Aptitude S shows significant correlation with the criteria of the Validation and Cross Validation Samples and Aptitudes G, P and K show significant correlations with the criterion of the Validation Sample.

Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes G, S, P, K and F (G, S, P, T and F for the Cross Validation Sample), and appropriate cutting scores for the Validation and Cross Validation Samples. Although some significant results were obtained for both samples with various sets of trial norms, it was found that the best selective efficiency was obtained with norms which included Aptitudes G, S, P and K. In view of these results, Aptitude F was excluded from further consideration and Aptitudes G, S, P and K (G, S, P and T for B-1001) were selected for inclusion in the test norms. The cutting scores for Aptitudes G, S, P and K were set at one standard deviation unit below the mean scores of the Combined Sample and rounded to the nearest five-point score levels. Setting cutting scores at these levels yielded the best selective efficiency for the Validation and Combined Samples as well as good selective efficiency for the Cross Validation Sample and resulted in B-1002 cutting scores of 100, 100, 100 and 95 for Aptitudes G, S, P and K, respectively. The B-1002 norms were converted to equivalent (on the basis of standard score equations) B-1001 norms consisting of G-105, S-105, P-100 and T-90.

Although there was some statistical evidence to warrant the inclusion of Aptitudes V, N and A, these aptitudes were omitted from the final test norms because they did not appear to be important on the basis of job analysis data or course descriptions. Although Aptitude M showed evidence of importance for this occupation in terms of the job analysis data and course descriptions, there was no statistical evidence to warrant its inclusion in the test norms.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficients between the test norms and the criteria and applying the Chi Square test, the criteria for the Validation and the Cross Validation Samples were dichotomized. For each sample, the criterion was dichotomized at the point which resulted in as close to one-third of the sample as possible being placed in the low criterion group.

The criterion for the Validation Sample was dichotomized by placing those students who received a grade-point average of 2.43 or higher in the high criterion group; those students who received a grade-point average of 2.42 or lower were placed in the low criterion group. This placed 34, or 33 percent, of the 102 students in the low criterion group.

The criterion for the Cross Validation Sample was dichotomized by placing those students who received a grade-point average of 2.41 or higher in the high criterion group; those students who received a grade-point average of 2.40 or lower were placed in the low criterion group. This placed 15, or 32 percent, of the 47 students in the low criterion group.

The B-1002 norms were used to compute the tetrachoric correlation and apply the Chi Square test for the Validation Sample, and the equivalent B-1001 norms were used when these computations were made for the Cross Validation Sample. The tetrachoric correlation and Chi Square test for the Combined Sample are based on a table which is a composite of the tables obtained for each sample for its respective norms.

Tables V-A and V-B show the discriminative value of the B-1002 norms and B-1001 norms for the Validation and Cross Validation Samples, respectively. Table V-C shows the discriminative value of the norms for the Combined Sample. In each table students in the low criterion group were designated as "poor students" and those in the high criterion group were designated as "good students."

TABLE V-A

Relationship between B-1002 Test Norms Consisting of Aptitudes G, S, P, and K with Critical Scores of 100, 100, 100, and 95, Respectively, and the Criterion for the Validation Sample

Clothes Designer (profess. + Kin.) 142.081
N = 102

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	17	51	68
Poor Students	17	17	34
Total	34	68	102

$r_{tet} = .41$

$\sigma_{r_{tet}} = .17$

$X^2 = 5.300$

$\frac{p}{2} < .025$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Validation Sample.

TABLE V-B

Relationship between B-1001 Test Norms Consisting of Aptitudes G, S, P, and T with Critical Scores of 105, 105, 100 and 90, Respectively, and the Criterion for the Cross Validation Sample

Clothes Designer (profess. + Kin.) 142.081
N = 47

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	10	22	32
Poor Students	11	4	15
Total	21	26	47

$r_{tet} = .62$

$\sigma_{r_{tet}} = .24$

$X^2 = 5.714$

$\frac{p}{2} < .01$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Cross Validation Sample.

TABLE V-C

Rolationship between Test Norms and the Critorion
for the Combined Samplo

B-1001 Norms: G-105, S-105, P-100, T-90
B-1002 Norms: G-100, S-100, P-100, K-95

Clothes Designor (profess. + kin.) 142.031
N = 149

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	27	73	100
Poor Studonts	28	21	49
Total	55	94	149

$r_{tet} = .47$ $\qquad$ $X^2 = 11.569$

$\sigma_{r_{tet}} = .14$ $\qquad$ $\frac{p}{2} < .005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Combined Sample. The Chi Square test indicates that there are fewer than five chances in one thousand that the obtained positive relationship between the test norms and the criterion occurred by chance.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis and course analysis data and their combined selective efficiency, it is recommended that Aptitudes G, S, P and K with minimum scores of 100, 100, 100, and 95, respectively, be used as B-1002 norms for Clothes Designer 0-46.01. Equivalent B-1001 norms consist of G-105, S-105, P-100, and T-90.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include four aptitudes, only those occupational aptitude patterns which includo three of those four aptitudes with cutting scores that are within ten points of the cutting scores established for the specific norms are considered for that occupation. The only one of the existing 22 occupational aptitude patterns which meets these criteria for this study is OAP-20, which consists of G-110, S-100, P-100 for B-1002. The selective efficiency of OAP-20 for this sample was determined by means of the tetrachoric correlation technique. A tetrachoric correlation of .35 with a standard error of .13 was obtained, which indicates a significant relationship between OAP-20 and the criterion for this experimental sample. The proportion of the sample screened out by OAP-20 was .54, which is within the required range of .10 to .60. Therefore, it is recommended that OAP-20 be used in counseling for the occupation of Clothes Designor 142.031.